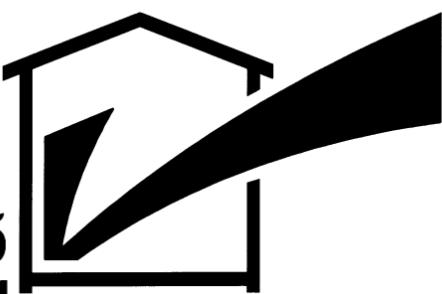
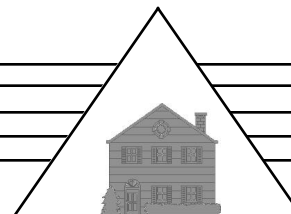




US DEPARTMENT OF ENERGY
BUILDING STANDARDS AND GUIDELINES PROGRAM



1995
MECcheck™
Software User's Guide
1995 Model Energy Code
Version 2.0

December 1995

MECcheck™ was developed by the Building Standards and Guidelines Program at Pacific Northwest National Laboratory for the U.S. Department of Housing and Urban Development (HUD) and the Rural Economic and Community Development (RECD, formerly Farmer's Home Administration) under contract with the U.S. Department of Energy's Office of Codes and Standards. Pacific Northwest National Laboratory is operated by Battelle Memorial Institute for the U.S. Department of Energy under Contract DE-AC06-76RLO 1830.



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The document’s *Table of Contents* will allow you to go to any chapter or chapter section by clicking on the chapter name or the page number.

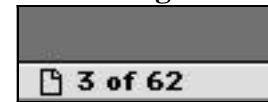
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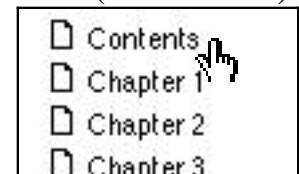
Page Numbering



Navigation Arrows



Bookmarks (and Cursor)



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1995 Model Energy Code
Version 2.0

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Contents

Chapter 1	Introduction	1
	What's in This Guide	1
Chapter 2	Model Energy Code Overview	3
Chapter 3	Quick Start	5
Chapter 4	Getting Started	7
	Conventions Used in This Guide	7
	What You Need to Run MECcheck™	8
	Memory Requirements	8
	Installing MECcheck™	8
	Starting MECcheck™	9
	Distribution Files	9
Chapter 5	Using MECcheck™	11
	Using the Keyboard and Mouse	11
	Action Keys	11
Chapter 6	Required Information	13
Chapter 7	Building Description	15
	Building Components List	17
Chapter 8	Building Components	21
	Ceilings	22
	Walls	23
	Glazing	24
	Doors	25
	Floors	25
	Basement Walls	26
	Slab Floors	29
	Crawl Space Walls	31
Chapter 9	Menus	33
	File Menu	33
	Trade-Offs Menu	35
	Project Menu	35
	Help Menu	36
Chapter 10	Optional Information	37
Chapter 11	HVAC Efficiency	39
Chapter 12	Files	41

Appendix A	Definitions	43
Appendix B	Glazing and Door U-Values	47
Appendix C	The Building Envelope	49
Appendix D	Project Report	51
Appendix E	Changing Location Files	55
Appendix F	Modifying the Cities or Counties	57

Chapter 1

Introduction

This user's guide describes how to use the MECcheck™ Software Version 2.0. MECcheck™ is designed to demonstrate compliance with the insulation and window requirements of the Council of American Building Officials (CABO) Model Energy Code (MEC). This version of MECcheck™ demonstrates compliance with the 1995 edition of the MEC.

What's in This Guide

Chapter 2, *Model Energy Code Overview*, briefly describes the MECcheck™ Software approach for achieving compliance as specified in the MEC.

Chapter 3, *Quick Start*, gives a short overview on how to install and run MECcheck™. This chapter is designed to get you up and running in no time.

Chapter 4, *Getting Started*, discusses conventions used in this user's guide, lists the computer equipment required to run MECcheck™, and provides further instructions on how to install and run MECcheck™.

Chapter 5, *Using MECcheck™*, describes the keys used to run MECcheck™.

Chapter 6, *Required Information*, explains how to enter your building location and construction type.

Chapter 7, *Building Description*, explains how to describe your building and check for compliance with the MEC.

Chapter 8, *Building Components*, describes the buttons at the top of the *Building Description* screen and how they are used to enter your building components.

Chapter 9, *Menus*, provides an overview of the MECcheck™ menu options.

Chapter 10, *Optional Information*, describes how to enter general information about your project.

Chapter 11, *HVAC Efficiency*, describes how to take credit for efficient heating and cooling equipment.

Chapter 12, *Files*, describes how to create, open, save, delete, and print files and reports.

Definitions of terms used in this guide are given in Appendix A. Glazing and door U-value tables which can be used in the absence of test data are provided in Appendix B. Appendix C describes the building envelope and contains a table that is useful in determining which elements of a building are considered to be ceiling,

wall, and foundation components. An example of a project report is shown in Appendix D. Appendix E gives instructions for changing from the cities version of MECcheckTM to the counties version, and vice versa. Appendix F discusses how you can modify the location and weather data file used in MECcheckTM.

Model Energy Code Overview

The MEC specifies thermal envelope requirements for residential buildings three stories or less in height. Maximum U-value^(a) requirements are specified for walls, ceilings, floors, crawl space walls, and basement walls and minimum R-value requirements are specified for slab floors. To comply with the MEC, a building must be constructed with components meeting or exceeding these requirements. However, the U-value of a given assembly may be increased or the R-value of a given assembly may be decreased, provided the total heat gain or loss for the entire building does not exceed the total resulting from conformance to the MEC requirements.

MECcheckTM performs a simple U-value x Area (UA) calculation for each building assembly to determine the overall UA of your building. The UA that would result from a building conforming to the MEC requirements is compared against the UA for your building. If the total heat loss (represented as a UA) through the envelope of your building does not exceed the total heat loss from the same building conforming to the MEC, then the software declares that you pass. Limited elements of a performance analysis are also implemented, including a high-efficiency equipment trade-off.

MECcheckTM is appropriate for insulation and window trade-off calculations in residential detached one- and two-family buildings (referred to as single-family buildings) and multifamily buildings (such as apartments, condominiums, townhouses, and rowhouses). Multifamily buildings include residential buildings three stories or less in height with three or more attached dwelling units. The MECcheckTM software generates a report that lists the insulation and window levels of your proposed building, as well as most of the additional basic requirements found in the MEC. Chapter 2 of the MECcheckTM Manual covers these other requirements in more detail.

(a) U-values are a measure of how well a material or series of materials conduct heat (higher U-values indicate more heat loss). For door and window assemblies, the U-value is the reciprocal of the R-value ($U\text{-value}=1/R\text{-value}$).

Quick Start

Installing MECcheck™

Insert the MECcheck™ floppy diskette into drive A: (or B:) and type **A:\INSTALL** (or **B:\INSTALL**). Follow the directions displayed on the screen.

Starting MECcheck™

After the installation program is complete, you will be in the MECcheck™ directory (C:\MECCHECK by default). Type **MECCHECK** to start the software.

Choosing Your Location

In the *Required Information* screen, you must enter the location of your building and indicate whether your building will be a single-family or multifamily building. MECcheck™ lists either the cities or counties for each state, depending on which version you are using. If you are using the cities version and your city is not in the list, choose the closest city with similar weather conditions. Select the **OK** button when finished.

Creating a Building Description

Use the eight buttons at the top of the *Building Description* screen to create a list of building components that describe the exterior envelope of your building. For each component selected, you must enter the component area or perimeter, insulation R-value, sheathing R-value, and/or U-value. Default R-values and U-values are supplied for you, but these should be changed to the values you intend to install in your building.

After you have entered all areas, R-values, and U-values, the program determines if your building design passes or fails. The results are displayed at the top of the screen in the *Compliance* box. If *Invalid Area* is displayed in this field, you have not filled in the area or perimeter for one or more components.

Adding a High-Efficiency Equipment Trade-Off

The *Heating and Cooling Efficiency* screen, accessed from the *Trade-Offs* menu, displays minimum Federal requirements for heating and cooling equipment efficiencies. If you plan to install heating or cooling equipment that is more efficient than these minimums, you may take a high-efficiency equipment credit.

Saving Your Building Description and Creating a Report

Use the **File** menu to save your data (**File->Save**). Then, create a report based on that data (**File->Create Report**). You can send the report to a file, to your printer, or to both simultaneously.

Noteworthy...

- If you want to delete a component from your list of components, move to the first column of that component (the text description) and press the **Enter** or the **Delete** key.
- Unlike Version 1.0, MECcheckTM Version 2.0 requires an area (ft²) for basement components, not a perimeter. Slab components still require a perimeter (ft).
- You can add multiple copies of any component by selecting that component's button more than once.
- If you need help, refer to the message at the bottom of the main screen or press **F1** for a help screen.

Getting Started

Conventions Used in This Guide

To help you identify information easily, the following conventions are used throughout this guide.

<u>Type Style</u>	<u>Used For</u>
ALL CAPITALS	File and directory names are capitalized. For example, this guide refers to the MECHECK directory and the EXAMPLE.MEC file.
<i>Bold Italics</i>	Commands are shown in bold italics. Commands must be typed exactly as they appear, though it does not matter if they are typed in capital or lower-case letters. For example, if you are asked to type <i>C:\MECCHECK</i> , you must type all bold characters, including the colon and backslash.
Bold Initial Caps	The keys on your keyboard, such as Tab and Shift+Tab , are shown in bold initial caps. Keyboard short cuts are referred to as hot keys. Some hot keys require you to hold down the Alt key while pressing another key. For example, you press Alt+F to select the <i>File</i> menu. In this guide, the hot keys for menus and buttons are shown in bold type. For example, when the guide refers to the H elp menu, the " H " is shown in bold type because Alt+H is the hot key used to select this menu.
<i>Italics</i>	An italic typeface is used to represent text as it appears on the screen in the program. The names of buttons, menus, fields, and screens are written in an italic typeface.
< >	Angle brackets are used to enclose a generic name or category. For example, Alt+<key> means that you should type Alt followed by some key. <filename> means any valid DOS filename.
->	An arrow is used to indicate a sequence of menu and submenu selections. For example, <i>Help->Index->Menus</i> means that you first select the <i>Help</i> menu option, then the <i>Index</i> option from the <i>Help</i> menu, and then the <i>Menus</i> option from the <i>Index</i> submenu.

What You Need to Run MECcheck™

MECcheck™ requires

- a personal computer with the Intel 80386 (386) processor (or higher)
- 530 kilobytes (KB) of conventional RAM memory.
- a hard disk with 1 megabyte (MB) of free disk space
- VGA or Super VGA monitor
- MS-DOS Version 3.1 or later. To check the version of your computer, type *ver* at the DOS prompt.

A Microsoft-compatible mouse is highly recommended but not required.

Memory Requirements

A minimum of 530K available RAM is recommended to operate the DOS version of MECcheck™. The actual memory requirement depends on the size of the building you construct and, thus, may vary. Memory resident software, local area networks (LANs), and some device drivers may interfere with the operation of MECcheck™ because they cut into the total available RAM. To check the amount of available memory, type

MEM

at the DOS prompt. Note the number of free bytes listed on your screen (e.g. *543459 bytes Free*). If less than 530,000 bytes are free, you may have to start your computer without the network or unload some terminate-stay-resident (TSR) software to free up enough memory. Memory managers and newer versions of DOS can be installed to free up some of your computer's RAM memory.

If you run out of memory while running MECcheck™, an error message is displayed and you are exited from the program. If this happens, the data that you have entered is lost unless it is saved prior to running out of memory. Therefore, it is advisable to periodically save your data by selecting the **File->Save** menu option.

Installing MECcheck™

You should install MECcheck™ onto your hard disk as instructed below. Running MECcheck™ from your hard disk improves program performance. Before installing MECcheck™, make sure your computer has the minimum hardware and software requirements.

To install MECcheck™ from the floppy diskette

1. Put the diskette in your floppy disk drive (usually A or B).
2. Type

A:\INSTALL (or *B:\INSTALL* if your diskette is in drive B)

then press **Enter**. The installation screen will appear. Follow the instructions on the screen. You will be asked to choose the drive and directory to which the MECcheck™ files will be copied. You may accept the default drive and directory

C:\MECCHECK

or you may type in the name of a different drive and/or directory. If you indicate a directory that already contains MECcheck™ Version 1.0, it will be replaced by Version 2.0.

Starting MECcheck™

To run MECcheck™ from your hard disk, type the following commands. These commands assume the software was installed in the default directory *C:\MECCHECK*. If not, you must change the commands to indicate the drive and directory where the software was installed. You must press **Enter** after each command.

<u>Command</u>	<u>Purpose</u>
<i>C:</i>	changes to the C: disk drive
<i>CD C:\MECCHECK</i>	makes MECCHECK the current directory
<i>MECCHECK</i>	starts MECcheck™

Distribution Files

You should now have the following files in your MECCHECK directory:

MECCHECK.EXE
MECCHECK.DAT
MEC.BAT
LOCATION
CITIES
COUNTIES
EXAMPLE.MEC
EXAMPLE.RPT

Using MECcheck™

Using the Keyboard and Mouse

MECcheck™ can be used with either the keyboard or a mouse. To choose a button, field, menu, or list on the screen with the keyboard, move the cursor to the desired object by using the action keys listed below. To choose a specific object with a mouse, move the mouse arrow to the desired object and click. To click a mouse, press and release the left mouse button once.

To view the action keys and their functions from within the program, select the *Help* menu located at the top of the screen and then choose *Action Keys*.

Action Keys

The action keys used in MECcheck™ are

F1	for context sensitive help, which explains the field or button the cursor is currently on
Alt+F1	for general information about the program
Tab	to move the cursor to the next field
Shift+Tab	to move the cursor to the previous field
Alt+<key>	to choose a button or menu option, where <key> is the underlined letter in the button or menu name. For example, press Alt+F to select the <i>File</i> menu
F10 or Alt	to move from the menu bar to the screen and back
Enter	to select the current button, menu option, or list item. In the <i>Building Description</i> screen, you can move the cursor to the first column of a component (the descriptive text) and press Delete or Enter to remove that component from the list
Up Arrow	to move to the previous selection in a list or menu. In the <i>Building Description</i> screen, press an Up Arrow to move to the previous building component
Down Arrow	to move to the next selection in a list or menu. In the <i>Building Description</i> screen, press a Down Arrow to move to the next building component

Right Arrow	to move to the next menu in the menu bar or the next selection in a group. In the <i>Building Description</i> screen, press a Right Arrow to move to the next sequential field
Left Arrow	to move to the previous menu in the menu bar or the previous selection in a group. In the <i>Building Description</i> screen, press a Left Arrow to move to the previous sequential field
Page Up (PgUp)	to move the cursor up one page in a list or multiline text field. In the <i>Building Description</i> screen, press Page Up to move the component records up one page (assuming there are more records than will fit on the screen)
Page Down (PgDn)	to move the cursor down one page in a list or multiline text field. In the <i>Building Description</i> screen, press Page Down to move the component records down one page (assuming there are more records than will fit on the screen)
Escape (Esc)	to remove temporary screens
Delete (Del)	to delete a character or text block. In the <i>Building Description</i> screen, you can move the cursor to the first column of a component (the descriptive text) and press Delete or Enter to remove that component from the list
Insert (Ins)	to toggle between insert and overstrike mode
Home	to move to the beginning of a line
End	to move to the end of a line.

Required Information

Your building's location and construction type (single family or multifamily) are entered in the *Required Information* screen. MECcheck™ lists either the cities or counties for each state, depending on which version you are using. The following illustration of the *Required Information* screen is from the cities version. The counties version is identical, except it lists counties for each state instead of cities. The location and construction type of your building are necessary for MECcheck™ to determine compliance. If this information is not accurate, the results will not be valid.

Whenever you exit MECcheck™, the currently selected building location and construction type are saved. When re-entering the software, the location and construction type fields are automatically updated to reflect your last entries.

Required Information Screen

State

To choose a new state, move to the *State* field and press **Enter** or use the mouse to select the arrow button to the right of the field. A list appears containing state names. You can scroll through this list with the **Up** and **Down Arrow** keys, the **Page Up** and **Page Down** keys, or by using the mouse and scroll bar located to the right of the list. Press **Enter** or click on your desired state with the mouse.

City/County

Each time you enter a new state, the list of cities or counties changes -- reflecting only the cities or counties located in the new state. To choose a new location, move to the *City* or *County* field and press **Enter** or use the mouse to select the arrow button to the right of the field. A list appears containing the names of cities or counties located in the selected state. You can scroll through this list with the **Up** and **Down Arrow** keys, the **Page Up** and **Page Down** keys, or by using the mouse and scroll bar located to the right of the list. Press **Enter** or click on your desired location with the mouse. If you are using the cities version and you cannot find the

city in which your building will be located, choose a city that is close to your building site and has similar weather conditions.

Construction Type

The MEC specifies different requirements for single-family and multifamily buildings, so MECcheck™ must know which of these construction types you are going to build. You must select either the single-family or the multifamily button.

Single Family

To choose single-family construction, press **Enter** or click on the *Single Family* button with the mouse. If the *Single Family* button is selected, an "X" appears in the square to the left of the text. Single-family buildings include all detached one- and two-family dwellings.

Multifamily

To choose multifamily construction, press **Enter** or click on the *Multifamily* button with the mouse. If the *Multifamily* button is selected, an "X" appears in the square to the left of the text. Multifamily buildings are three stories or less in height and contain three or more attached dwelling units. Apartments, condominiums, townhouses, and rowhouses are included in this category. Multifamily buildings can be considered as a whole or separate reports can be generated for each dwelling unit. Where individual units are identical, one report may be submitted as representative of the others. Contact the authority having jurisdiction to determine which approach to take.

Building Description

The *Building Description* screen is the MECcheck™ main screen. The eight buttons located in the Tool Bar at the top of the screen are used to choose building components describing your home (see Chapter 8 for details on the building components). Each component you choose is added to the building components list, which is displayed on the *Building Description* screen. The message at the bottom of the screen explains what type of information goes into the currently selected field.

Title Bar →

Menu Bar →

Tool Bar →

MECcheck 2.0 / 1995 MEC		Building Description:	
File Trade-Offs Project Help			
Ceilings	Walls	Glazing	Doors
Floors	Basement	Slab	Crawl
Compliance	<input type="text"/>	Required UA	<input type="text" value="0"/>
		Your Home	<input type="text" value="0"/>
Area or Perimeter	Insulation R-Value	Sheathing R-Value	Glazing/Door U-Value UA
Use the buttons at the top of the screen to create a building description.			

Building Description Screen (Before Entering Data)

After you have filled in the information about each component, the program computes the UA of your proposed building and the UA of the code building. The code building has the same dimensions as your building but conforms to the MEC requirements. If the total UA of your building is less than or equal to the total UA of the code building, your building complies with the MEC and the *Compliance* field displays the message "Passes."

MECcheck 2.0 / 1995 MEC		Building Description: example.mec		
File Trade-Offs Project Help				
Ceilings	Walls	Glazing	Doors	
Floors	Basement	Slab	Crawl	
Compliance <input type="text" value="Passes"/>		Required UA <input type="text" value="467"/>	Your Home <input type="text" value="416"/>	
	Area or Perimeter	Insulation R-Value	Sheathing R-Value	
			Glazing/Door U-Value	
			UA	
CEILINGS	<input type="text" value="729"/>	<input type="text" value="38"/>	<input type="text" value="0"/>	22
CEILINGS	<input type="text" value="592"/>	<input type="text" value="30"/>	<input type="text" value="0"/>	21
WALLS: Wood Frame, 16" O.C.	<input type="text" value="1339"/>	<input type="text" value="13"/>	<input type="text" value="6"/>	82
WALLS: Wood Frame, 16" O.C.	<input type="text" value="258"/>	<input type="text" value="13"/>	<input type="text" value="0"/>	21
GLAZING: Windows or Doors	<input type="text" value="284"/>		<input type="text" value="0.45"/>	32
GLAZING: Windows or Doors	<input type="text" value="84"/>		<input type="text" value="0.61"/>	51
DOORS	<input type="text" value="20"/>		<input type="text" value="0.54"/>	11
DOORS	<input type="text" value="10"/>		<input type="text" value="0.35"/>	6
FLOORS: Over Unconditioned Space	<input type="text" value="938"/>	<input type="text" value="19"/>		45
FLOORS: Over Outside Air	<input type="text" value="32"/>	<input type="text" value="30"/>		1
SLAB FLOORS: Unheated, 24.0" insul.	<input type="text" value="02"/>	<input type="text" value="0"/>		04

Use the buttons at the top of the screen to create a building description.

Building Description Screen (After Entering Data)

- Title Bar** The Title Bar on the *Building Description* screen displays the name of the currently open project data file. If no project data file is open, the Title Bar only displays the name of the screen -- *Building Description*.
- Menu Bar** The Menu Bar is located directly under the Title Bar and displays the available menus. The Menu Bar contains four menus -- *File*, *Trade-Offs*, *Project*, and *Help*. These menus are discussed in more detail in Chapter 9.
- Tool Bar** The Tool Bar is a row of eight buttons located directly under the Menu Bar. The buttons on the Tool Bar are used to create a list of building components describing your building. These buttons are discussed in more detail in Chapter 8.
- Compliance** The *Compliance* field tells you whether your building complies with the MEC. One of the following messages is displayed:

Message	Meaning
<i>Invalid Area</i>	You have not entered the area and/or perimeter of one or more building components
<i>Passes</i>	Your building design complies with the MEC
<i>Fails</i>	Your building design DOES NOT comply with the MEC
<i>Required UA</i>	The <i>Required UA</i> field displays the total UA of the code building (the house built to MEC requirements). To demonstrate compliance with the MEC, the UA of your house must be less than or equal to the UA displayed in this field.
<i>Your Home</i>	The field labeled <i>Your Home</i> displays the UA of your proposed building based on the building components you chose from the Tool Bar and the information you supplied about each of these components. The UA displayed in this field must be less than or equal to the UA displayed in the <i>Required UA</i> field to demonstrate compliance with the MEC.

Building Components List

As you choose building components, a list of your choices is created and displayed on the *Building Description* screen. Almost all components in this list require an area or perimeter entry. Some components require an insulation R-value, a sheathing R-value, and/or an assembly U-value. These entries are briefly described in this chapter. Refer to Chapter 8 for a discussion of the specific inputs required for each component type.

	Area or Perimeter	Insulation R-Value	Sheathing R-Value	Glazing/Door U-Value	UA
CEILINGS	729	38	0		22
CEILINGS	592	38	0		21
WALLS: Wood Frame, 16" O.C.	1339	13	6		82
WALLS: Wood Frame, 16" O.C.	258	13	0		21
GLAZING: Windows or Doors	284			0.45	32
GLAZING: Windows or Doors	84			0.61	51
DOORS	20			0.54	11
DOORS	10			0.35	6
FLOORS: Over Unconditioned Space	938	19			45
FLOORS: Over Outside Air	32	30			1
SLAB FLOORS: Unheated, 24.0" insul.	02	0			04

Building Components List

Area or Perimeter

You must enter an integer value representing the area or perimeter of each component in your building design. For wall components, enter the net opaque wall area (do not include windows and doors). For ceiling components, enter the net opaque ceiling area (do not include skylights). Slab floor components require a perimeter and must be entered in linear feet. All other components require an area in square feet. You must enter a positive integer value in each *Area or Perimeter* field before compliance can be determined.

Insulation R-Value

Enter the R-value of the insulation to be installed for each ceiling, wall, floor, and foundation component. Do not include the R-value of insulating sheathing (which is entered in the *Sheathing R-Value* fields) or other materials (such as framing or structural sheathing).

- **Ceilings.** Provide the R-value of the cavity insulation to be installed. For stress-skin insulated ceiling panels, enter the manufacturer-rated R-value for the entire assembly.
- **Walls.** Provide the R-value of the cavity insulation to be installed in wood- or metal-frame walls. For concrete and masonry walls, enter the interior wall insulation only. For stress-skin insulated wall panels, enter the manufacturer-reported test R-value for the entire assembly.
- **Floors.** Provide the R-value of the cavity insulation to be installed.
- **Basement Walls.** Provide the R-value of the insulation to be installed. If you intend to install both exterior and interior insulation, enter the sum of both R-values. For insulating foam concrete form systems and premanufactured concrete panels, enter the manufacturer rated R-value for the entire assembly.
- **Slab Floors.** Provide the R-value of the insulation to be installed around the slab perimeter.
- **Crawl Space Walls.** Provide the R-value of the insulation to be installed on the crawl space walls.

Sheathing R-Value

Enter the R-value of any insulating sheathing material to be installed. Do not include the R-value of other materials (such as exterior siding, roofing, structural sheathing, and interior drywall). If no sheathing will be installed, enter zero. The following components have *Sheathing R-Value* fields:

- **Ceilings.** For ventilated ceilings, insulating sheathing must be placed between the conditioned space and the ventilated portion of the roof (typically applied to the trusses or rafters immediately behind the drywall or other ceiling finish material).

- **Wood- and Metal-Frame Walls.** Enter the R-value of exterior insulating sheathing.
- **Concrete or Masonry Above-Grade Walls.** Enter the R-value of all insulation to be installed on the exterior of the wall.

Glazing/Door U-Value

For windows, doors, and skylights, enter the assembly U-value of each glazing and door component. U-values for glazing assemblies and opaque doors must be tested and documented by the manufacturer in accordance with the NFRC^(a) test procedure or taken from Appendix B of this user's guide.

UA

For ceilings, walls, floors, and foundations, the component's U-value is computed based on the cavity insulation and sheathing (where appropriate). For glazing and doors, you are asked to enter the U-value directly into the *Glazing/Door U-Value* fields. Each component U-value is multiplied by its corresponding area to give a UA value (U-value x Area).^(b) The UA of each component is displayed in the far right column on the screen. You cannot directly alter the UA values. They are displayed to give you some indication of how each component impacts the total UA of your building. A large UA indicates the heat loss through that component is more significant than the heat loss through a component with a small UA.

(a) National Fenestration Rating Council/NFRC 100-91: *Procedure for Determining Fenestration Product Thermal Properties*.

(b) Slab UAs are actually the result of multiplying an F-value by a perimeter.

Building Components

The buttons at the top of the *Building Description* screen are used for choosing the building components in your proposed design. You can select from eight buttons representing general building components -- ceilings, walls, glazing, doors, floors, basement walls, slab floors, and crawls space walls. When you select any of these buttons except the *Doors* button, you are prompted for more information about the component. After supplying this information, the component is added to the list displayed on the *Building Description* screen. A door entry does not require any additional information; therefore, selecting the *Doors* button causes a door component to be added directly to the building components list. The list continues to grow as you add new components. You may add as many components as you need to describe your building, including multiple components of the same type.

This chapter describes the eight building components that you will use to create your own building components list and the information you are asked to provide about each component.

Building Component Buttons

Floors

Select the floor type(s):

☒ Floor Over Unconditioned Space

☒ Floor Over Outdoor Air

OK Cancel

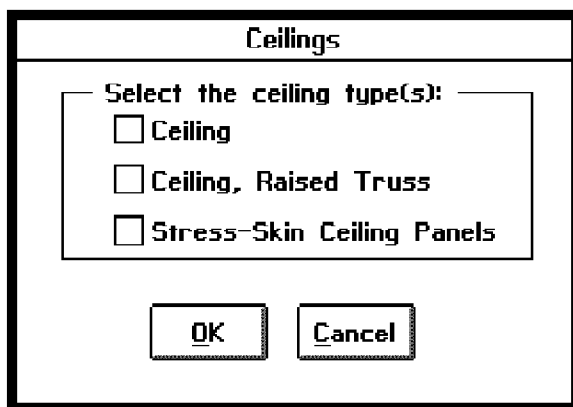
Building Components List

	Area or Perimeter	Insulation R-Value	Sheathing R-Value	Glazing/Door U-Value	UA
DOORS	20			0.54	11
DOORS	18			0.35	6
FLOORS: Over Unconditioned Space	938	19			45
FLOORS: Over Outside Air	32	30			1
SLAB FLOORS: Unheated, 24.0" insul.	02	0			64

Adding Floor Components to the Building Components List

Ceilings

When you select the *Ceilings* button, the *Ceilings* screen appears.

The image shows a dialog box titled "Ceilings". Inside the dialog, there is a section labeled "Select the ceiling type(s):" followed by a list of three options, each with an unchecked checkbox: "Ceiling", "Ceiling, Raised Truss", and "Stress-Skin Ceiling Panels". At the bottom of the dialog, there are two buttons: "OK" and "Cancel".

Ceilings Screen

Ceiling types can be toggled on and off by clicking on them with the mouse or pressing **Enter** when they are highlighted. If a ceiling type is selected, an "X" appears in the square to the left of the text. After choosing one or more ceiling types, select the **OK** button to transfer them to your list of building components. Select the **Cancel** button to return to the *Building Description* screen without adding any new ceiling components.

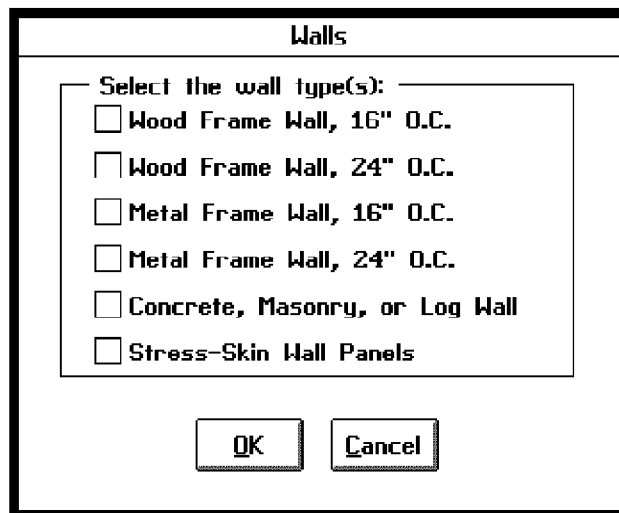
After creating a ceiling component, provide the net ceiling area in its corresponding area field (do not include the area of skylights). Ceiling area should be measured on the slope of the finished interior surface.

Enter the R-value of the insulation to be installed in each ceiling component in its corresponding *Insulation R-Value* field and enter the R-Value of insulating sheathing (if used) in the *Sheathing R-Value* field. For ventilated ceilings, insulating sheathing must be placed between the conditioned space and the ventilated portion of the roof (typically applied to the trusses or rafters immediately behind the drywall or other ceiling finish material). Sheathing placed on the roof deck over a ventilated attic does not qualify. For stress-skin insulated ceiling panels, enter the manufacturer-rated R-value for the entire assembly.

To receive credit for a raised truss, the insulation must achieve its full insulation thickness over the exterior walls.

Walls

When you select the *Walls* button, the *Walls* screen appears.



The screenshot shows a dialog box titled "Walls". Inside the dialog, there is a section labeled "Select the wall type(s):" followed by a list of six wall types, each preceded by an unchecked checkbox:

- ☐ Wood Frame Wall, 16" O.C.
- ☐ Wood Frame Wall, 24" O.C.
- ☐ Metal Frame Wall, 16" O.C.
- ☐ Metal Frame Wall, 24" O.C.
- ☐ Concrete, Masonry, or Log Wall
- ☐ Stress-Skin Wall Panels

At the bottom of the dialog box are two buttons: "OK" and "Cancel".

Walls Screen

Wall types can be toggled on and off by clicking on them with the mouse or pressing **Enter** when they are highlighted. If a wall type is selected, an "X" appears in the square to the left of the text. To qualify as a concrete or masonry wall, the wall must have a heat capacity greater than or equal to 6 Btu/ft²·°F (123 kJ/m²·°K). Masonry and concrete walls having a mass greater than or equal to 30 lb/ft² (146 kg/m²) and solid wood walls having a mass greater than or equal to 20 lb/ft² (98 kg/m²) will meet this requirement. Stress-skin wall panels are typically 4- to 6-in. stressed skin panels with foam insulation sandwiched between oriented strand-board (OSB). After choosing one or more wall types, select the **OK** button to transfer them to your list of building components.

After creating a wall component, provide the net wall area in its corresponding area field. The net wall area includes

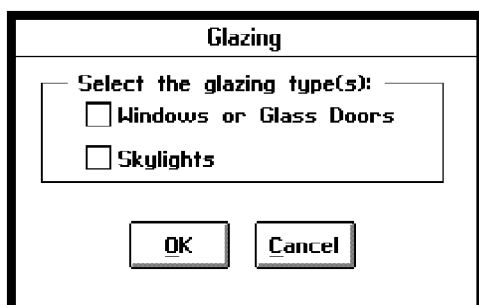
- the opaque area of all above-grade walls enclosing conditioned spaces, excluding doors and windows
- the peripheral edges of floors (the area of the band joist and subfloor between floors)
- the opaque area of any individual wall of a conditioned basement with an average depth less than 50% below grade (excluding basement doors and windows but including the below-grade portion of the wall). For further clarification refer to the basement wall examples given later in this Chapter.

Enter the R-value of the insulation to be installed in each wall component in its corresponding *Insulation R-Value* field. For stress-skin panels, enter the manufacturer-reported test R-value for the entire assembly.

Enter the R-value of the insulating sheathing to be installed (if any) in the *Sheathing R-Value* field. For concrete and masonry walls, enter the R-value of any insulation to be installed on the interior of the wall in the *Insulation R-Value* field and enter the R-value of any insulation to be installed on the exterior of the wall in the *Sheathing R-value* field.

Glazing

When you select the *Glazing* button, the *Glazing* screen appears. Glazing is any translucent or transparent material in exterior openings, including windows, sliding-glass doors, patio doors, skylights, and glass block.

A dialog box titled "Glazing" with a black border. Inside, there is a section titled "Select the glazing type(s):" containing two checkboxes: "Windows or Glass Doors" and "Skylights". At the bottom of the dialog box are two buttons: "OK" and "Cancel".

Glazing Screen

After choosing one or more glazing components, select the **OK** button to transfer them to your list of building components. If you need more than one entry of the same glazing type, repeat this process to add additional components. You are not required, however, to add a new component to your list for each glazing assembly in your building. All glazing assemblies with the same U-value can be entered as a single component by entering the sum of the glazing assembly areas into the corresponding area field.

After creating a glazing component, provide the area for each component in its corresponding area field. Glazing area is the interior surface area of the entire assembly, including glazing, sash, curbing, and other framing elements. The nominal area or rough opening is also acceptable for flat windows. The area of windows in the exterior walls of conditioned basements should be included. Windows in unconditioned basements are *NOT* included.

Enter the U-value for each component in its corresponding U-value field. U-values for glazing must be tested and documented by the manufacturer in accordance with the NFRC test procedure or taken from Appendix B of this user's guide. Center-of-glass U-values cannot be used.

Doors

Select the *Doors* button to add a door component to your design. Each time the *Doors* button is selected, a new door component is added to the list. Enter the nominal door area or rough opening area of all exterior doors in the *Area or Perimeter* fields and the U-value for each door component in the *Glazing/Door U-value* field. Doors located in the walls of conditioned basements and doors separating a conditioned space from an unconditioned garage must be included.

If you need more than one door component, repeat this process to add additional components to the list. You are not required, however, to add a new component to your list for each door in your building. All doors with the same U-value may be entered as a single component by entering the sum of the door areas into the corresponding area field.

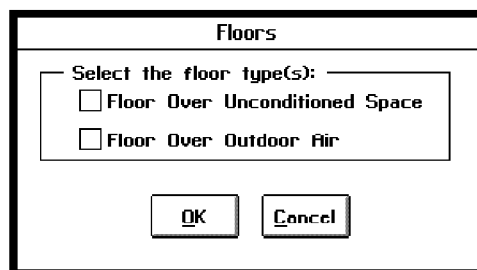
Door U-values must be tested and documented by the manufacturer in accordance with the NFRC test procedure or taken from Appendix B of this user's guide. If the door is rated with an aggregate R-value (an R-value that includes both the glass and opaque area), the following equation applies:

$$U\text{-Value} = \frac{1}{R\text{-Value}}$$

If a door contains glass and an aggregate R-value or U-value rating for that door is not available, enter the door's glass area as a separate glazing component and enter the opaque door U-value and area as a door component. The U-values listed in Appendix B are only for doors without glass.

Floors

When you select the *Floors* button, the *Floors* screen appears.



Floors

Select the floor type(s):

☐ Floor Over Unconditioned Space

☐ Floor Over Outdoor Air

OK Cancel

Floors Screen

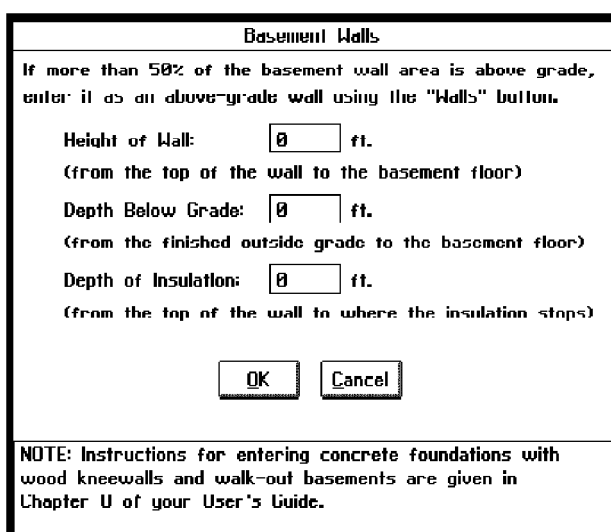
Floors over unconditioned space include all floors over unconditioned (neither heated nor cooled) basements, crawl spaces, and garages. Floors over outdoor air include floor cantilevers, floors of an elevated home, and floors of overhangs (such as the floor directly above a recessed entryway or open carport). Floors over

heated spaces are not part of the building envelope and should not be included. See Appendix C for an explanation of the building envelope.

Select one or more floor types, then select the **OK** button to transfer them to your list of building components. After creating a floor component, provide the floor area in its corresponding area field. Exclude porches, carports, exterior stairways, chimneys, and similar spaces. Enter the R-value of the insulation to be installed in each floor component in its corresponding insulation R-value field.

Basement Walls

When you select the **Basement** button, the *Basement Walls* screen appears.



The screenshot shows a dialog box titled "Basement Walls". Inside, there is a note: "If more than 50% of the basement wall area is above grade, enter it as an above-grade wall using the 'Walls' button." Below this, there are three input fields, each with a value of "0" and a unit of "ft.". The first is "Height of Wall:" with a subtext "(from the top of the wall to the basement floor)". The second is "Depth Below Grade:" with a subtext "(from the finished outside grade to the basement floor)". The third is "Depth of Insulation:" with a subtext "(from the top of the wall to where the insulation stops)". At the bottom are "OK" and "Cancel" buttons. A "NOTE" at the very bottom states: "NOTE: Instructions for entering concrete foundations with wood kneewalls and walk-out basements are given in Chapter U of your User's Guide."

Basement Walls Screen

Any individual wall of a conditioned basement with an average depth 50% or more below grade should be entered using the **Basement** button. Walls of conditioned basements with an average wall area less than 50% below grade should be entered as an above-grade wall using the **Walls** button.

The *Basement Walls* screen requires the following information:

Height of Wall Provide the height of the wall (ft) as measured from the top of the wall to the basement floor.

Depth Below Grade Provide the depth (ft) that the wall extends from the finished grade surface to the basement floor. If the grade is sloped or uneven, provide an average depth below grade.

Depth of Insulation

Provide the depth (ft) of the insulation you intend to install on your basement wall as measured from the top of the wall to where the insulation stops. The insulation must extend from the top of the basement wall downward to a depth equal to the value entered in this field. Note that for a fully insulated wall, the depth of insulation should be equal to the height of the wall. For basement walls with non-uniform insulation depths, enter an average. MECcheck™ accepts basement insulation depths from 0 to 10 ft. If you enter a depth of 0, the program assumes no insulation is to be installed and the R-value of your insulation is set to R-0.

After providing the above information, select the **OK** button to add this basement wall component to your list of building components. The information that you have entered in the *Basement Walls* screen will become part of the component description and cannot be altered once the component is added to your list. If you later decide to change this information, you must delete the original basement component and add a new basement component to your list.

After adding a basement wall component to your list, you must provide the basement opaque wall area (ft²) in the *Area or Perimeter* field. The area of basement windows and doors should not be included but, instead, should be entered using the **Glazing** and **Doors** buttons.

Enter the R-value of the insulation to be installed in the *Insulation R-Value* field. If you intend to install insulation on both the exterior and interior of the wall, enter the sum of both R-values.

Multiple Components: Uniform basement walls may be entered as a single component. If a wall has more than one insulation R-value, you should enter that wall as two separate basement wall components. In this case, provide the above information for each wall section as if it were a stand-alone wall. For example, enter the height of the wall section under consideration instead of the height of the entire wall. The following examples illustrate how to enter concrete foundations with wood kneewalls, walk-out basements, and basement walls constructed from specialty foundation systems.

Example 1: Wood Kneewalls

Assume a basement is to be constructed with 3-ft-high wood kneewalls built on a 5-ft-high concrete foundation. R-13 insulation will be installed in the wood kneewall cavities and R-5 rigid insulation will be installed on the concrete foundation walls. The wood kneewalls are completely above grade and fully insulated. The concrete foundation walls are 4 ft below grade and fully insulated.

Create one basement wall component for the wood kneewalls and enter the following information:

- *Height of Wall* 3 ft
- *Depth Below Grade* 0 ft
- *Depth of Insulation* 3 ft.

Create a second basement wall component for the concrete foundation and enter the following information.

- *Height of Wall* 5 ft
- *Depth Below Grade* 4 ft
- *Depth of Insulation* 5 ft.

Two basement wall components will be added to your list of building components. Provide the opaque wall area of the wood kneewalls and enter the insulation R-value as R-13. Provide the opaque wall area of the concrete foundation walls and enter the insulation R-value as R-5.

Example 2: Walk-Out Basement

Assume an 8-ft basement is to be built on a slope so that the front wall is 7 ft below grade and the rear wall is totally above grade. The ground level along both side walls is sloped so that approximately 50% of each wall is below grade. The rear basement wall will be wood-frame construction with R-19 insulation. The other three walls will be concrete walls with R-10 insulation. All four walls will be fully insulated.

Create one basement component for the front wall and enter the following information:

- *Height of Wall* 8 ft
- *Depth Below Grade* 7 ft
- *Depth of Insulation* 8 ft.

The two side walls are at least 50% below grade, so they are entered as a basement wall component. If they were less than 50% below grade, they would be entered as an above-grade wall component. Therefore, create a second basement wall component for the two side walls and enter the following information:

- *Height of Wall* 8 ft
- *Depth Below Grade* 4 ft
- *Depth of Insulation* 8 ft.

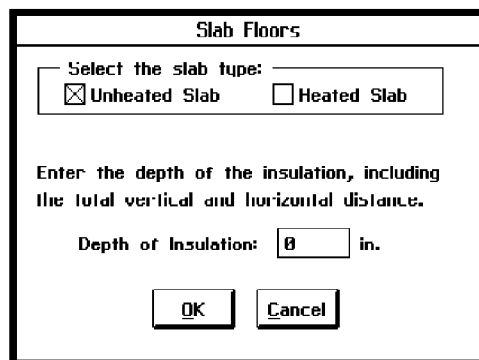
The rear wall is fully above grade and should be entered as an above-grade wall using the **Walls** button. Note that the basement floor along this wall should be considered a slab-on-grade component. Create a slab component using the **Slab** button and enter the length of the basement floor along this wall in the *Area or Perimeter* field.

Example 3: Specialty Foundation Systems

Manufacturers of insulating foam concrete form systems and premanufactured concrete panels with integrated insulation generally supply R-value ratings for the entire wall, not just the insulation. Where the R-value of the insulation alone is not known, the manufacturer overall wall R-value rating may be used in the *Insulation R-value* field.

Slab Floors

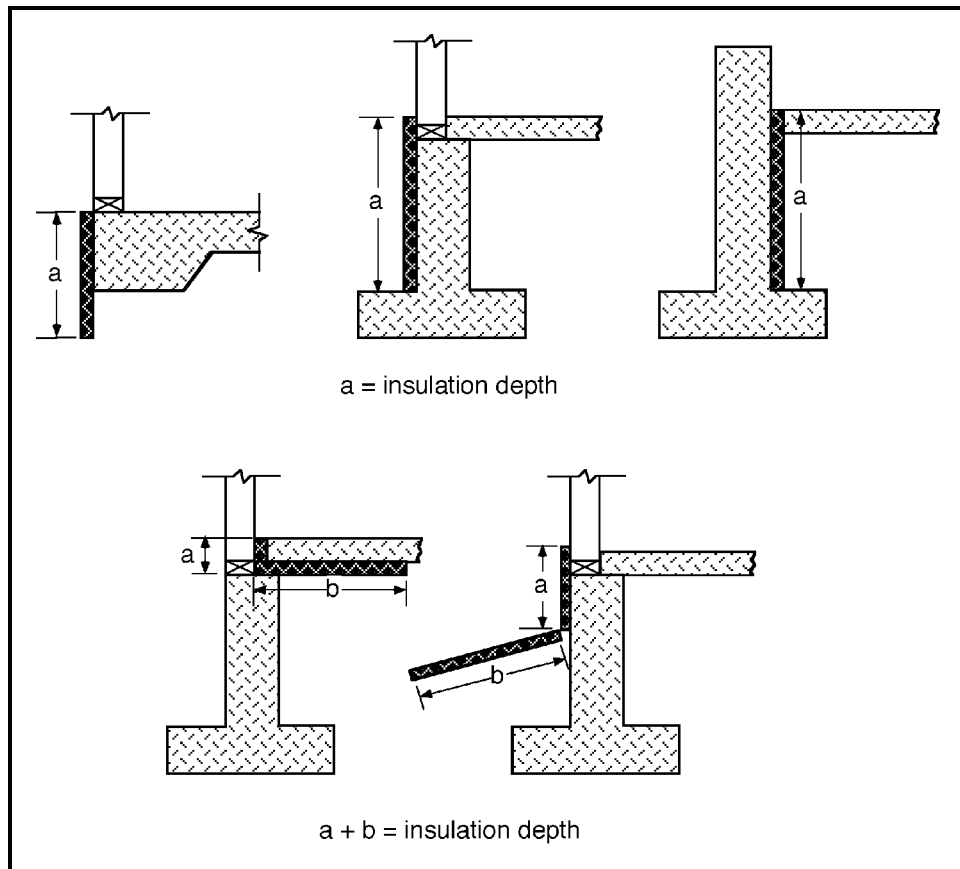
When you select the *Slab* button, the *Slab Floors* screen appears.

*Slab Floors Screen*

To add a slab component to your list of building components, select the desired slab type with the mouse or use the arrow keys to highlight your choice then press **Enter** to select it. A heated slab is one in which the heating elements or hot air distribution system is in contact with or placed within the slab or the subgrade.

In the *Depth of Insulation* field, you must provide the depth (in.) of the insulation you intend to install around your slab perimeter. The insulation can be installed using any of the following configurations, but in all cases it must start at the top of the slab:

- The slab insulation extends from the top of the slab downward to the specified depth.
- The slab insulation extends from the top of the slab downward to the bottom of the slab and then horizontally underneath the slab for a minimum total distance equal to or greater than the specified depth.
- The slab insulation extends from the top of the slab downward to the bottom of the slab and then horizontally away from the slab for a minimum total distance equal to or greater than the specified depth. The horizontal insulation must be covered by pavement or at least 10 in. of soil.



Slab Insulation Depth

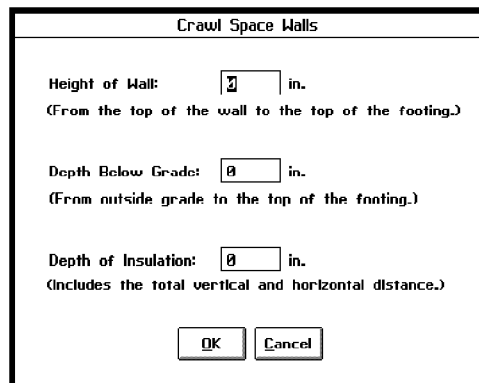
The top edge of insulation installed between the exterior wall and the interior slab can be cut at a 45° angle away from the exterior wall.

MECcheckTM accepts slab insulation depths from 0 to 48 in. If you enter a depth of 0, the program assumes no insulation is to be installed and the R-value of your insulation is set to R-0.

After adding a slab component, provide the perimeter of the slab floor in its corresponding *Area or Perimeter* field and provide the R-value of the perimeter insulation in the *Insulation R-Value* field.

Crawl Space Walls

When you select the *Crawl* button, the *Crawl Space Walls* screen appears.



Crawl Space Walls Screen

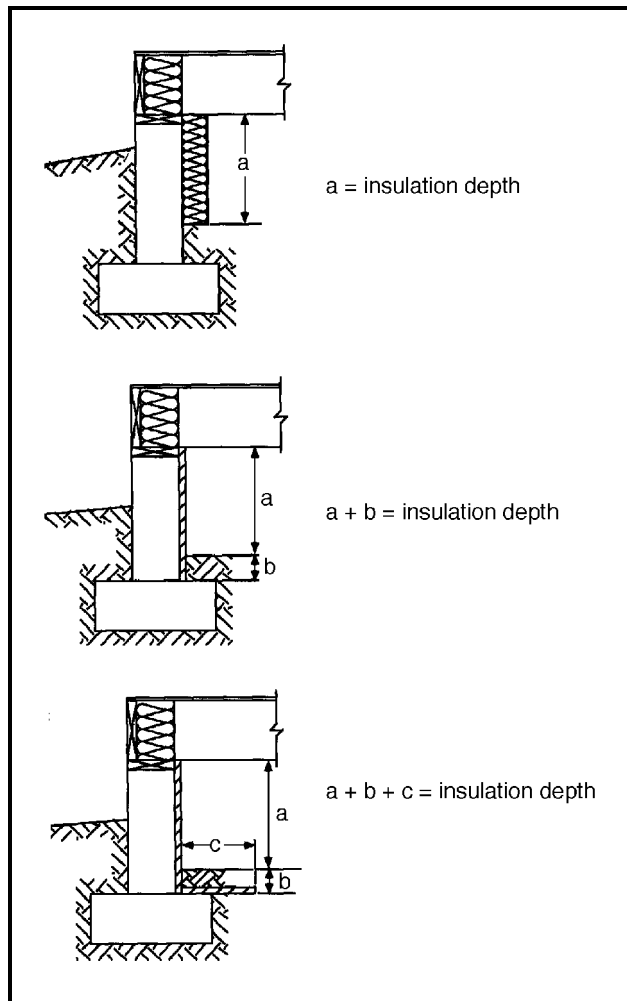
The crawl space wall option is for walls of unventilated crawl spaces (i.e. not directly vented to the outside). The *Crawl Space Walls* screen requires the following information:

Height of Wall Provide the height of the wall (in.) as measured from the top of the crawl space wall to the top of the footing.

Depth Below Grade Provide the depth (in.) that the wall extends from the outside finished grade surface to the top of the footing.

Depth of Insulation In the *Depth of Insulation* field, provide the depth (in.) of the insulation you intend to install as measured from the top of the wall to where the insulation stops. This distance should include the total vertical and horizontal distance (see the following illustration). Because the horizontal distance is included, the depth of insulation may be greater than the height of the wall. MECcheckTM accepts crawl space wall insulation depths from 0 to 84 in. If you enter a depth of 0, the program assumes no insulation is to be installed and the R-value of your insulation is set to R-0.

Select the **OK** button to add this crawl space wall component to your list of building components. The information that you have entered in the *Crawl Space Walls* screen will become part of the component description and cannot be altered once the component is added to your list. If you later decide to change this information, you must delete the original crawl space wall component and add a new crawl space wall component to your list.



Crawl Space Wall Insulation Depth

After adding a crawl space wall component to your list, you must provide the crawl space opaque wall area (ft²) in the *Area or Perimeter* field. The area should include the area of the entire wall, even if only a portion of the wall is insulated. Enter the R-value of the insulation to be installed in the *Insulation R-Value* field.

Menus

The Menu Bar located at the top of the *Building Description* screen is used to select the **File**, **Trade-Offs**, **Project**, and **Help** menus.

File Menu

The data you enter into MECcheck™ can be stored on your hard disk in a project data file. Separate data files can be created for different building projects or for alternate designs of the same project. Data files allow you to retrieve and alter designs at any time. Report files allow you to print the information you have entered and to document the compliance results determined by MECcheck™. The **File** menu contains options allowing you to create (*New*), retrieve (*Open*), and save project data files and to create project reports.

In this guide, filename refers to a standard DOS filename, which can be up to eight characters in length with an extension of up to three characters. Data files created by MECcheck™ must have the extension .MEC, and report files must have the extension .RPT. If you prefer, when you are asked to provide a filename, you may leave the extensions off and let MECcheck™ enter them for you. For more details, see Chapter 12.

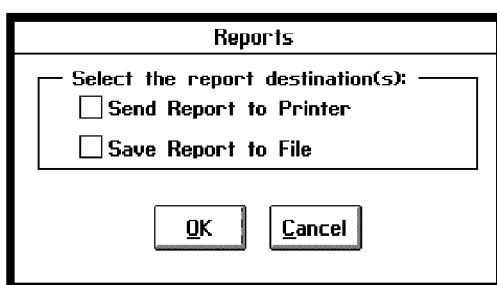
MECcheck 2.0 / 1995 MEC		Building Description:	
File	Trade-Offs	Project	Help
New Open Save Save As Delete Create Report Exit	Glazing	Doors	Floors
	Basement	Slab	Crawl
	Required UA		0
	Your Home		0
	Area or Perimeter	Insulation R-Value	Sheathing Glazing/Door R-Value U-Value UA

File Menu

New

The *New* option allows you to erase the current data and begin a new project data file. When you select *New*, MECcheck™ asks if you wish to save the current data. Select *Yes* to save the current data or *No* if you do not want to save the current data. If you select *Yes* and a file is already open, the open file is updated to contain the current data. If no file is open, the *Files* screen appears and you are asked for a filename to which the data will be saved.

- Open** When you want to revise or examine an existing file, you must retrieve a copy of the file by bringing it to the screen. This is referred to as *opening* the file. The **Open** option allows you to open an existing project data file. When you select **Open**, the *Files* screen appears and you are asked for the filename of the project data file to retrieve. If an existing file is already open, you are asked if you wish to save the currently open file before opening another file.
- Save** The **Save** option allows you to save your current data to the filename shown on the Title Bar. If no file is open, the *Files* screen appears and you are asked for a filename.
- Save As** The **Save As** option allows you to save your current project data file to a new name. This option is useful when an existing file is opened then modified. If you want to save copies of both the original and modified file, use **Save As** to rename the modified file.
- Delete** The **Delete** option allows you to erase a previously created project data file. When you select **Delete**, the *Files* screen appears and you are asked for the name of the file to be deleted.
- Create Report** The **Create Report** option allows you to generate a report listing project data and compliance results. When you select the **Create Report** option, the *Reports* screen appears, asking whether the report should be saved to a file or sent to the printer (you may select both). If you elect to send the report to the printer, the report is sent to LPT1. A report cannot be printed if a printer is not correctly connected to LPT1. An example report is contained in Appendix D and is included with the MECcheck™ software (EXAMPLE.RPT).



Reports Screen

- Exit** The **Exit** option allows you to exit MECcheck™ and return to DOS.

Trade-Offs Menu

The *Trade-Offs* menu is used to select non-envelope trade-offs. MECcheck™ Version 2.0 offers trade-offs for high-efficiency heating and cooling equipment. Chapter 11 explains how to use the high-efficiency equipment trade-off.

MECcheck 2.0 / 1995 MEC		Building Description:	
File Trade-Offs Project Help			
Ceiling	HVAC Efficiency	Glazing	Doors
Floors	Basement	Slab	Crawl
Compliance <input type="text"/>		Required UA <input type="text"/> Your Home <input type="text"/>	
Area or Perimeter	Insulation R-Value	Sheathing R-Value	Glazing/Door U-Value UA

Trade-Offs Menu

Project Menu

The *Project* menu is used to bring up the *Required Information* and *Optional Information* screens.

MECcheck 2.0 / 1995 MEC		Building Description:	
File Trade-Offs Project Help			
Ceilings	Walls	Required Information	Floors
Basement	Slab	Crawl	
Compliance <input type="text"/>		Required UA <input type="text"/> Your Home <input type="text"/>	
Area or Perimeter	Insulation R-Value	Sheathing R-Value	Glazing/Door U-Value UA

Project Menu

Required Information

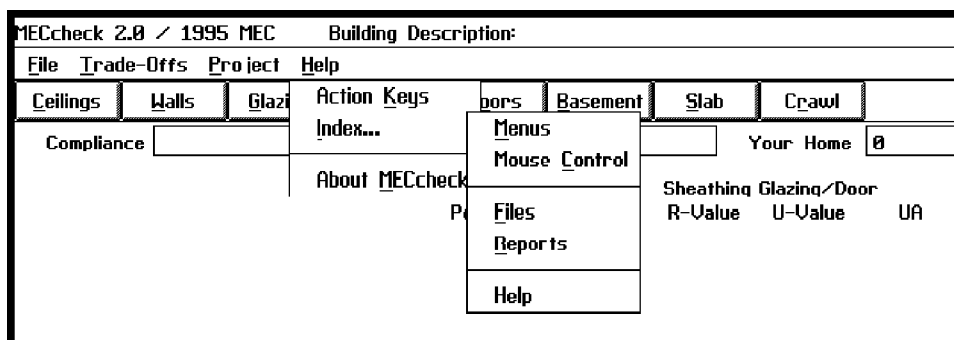
When you select *Required Information*, you are asked to provide your building's location and construction type (single family or multifamily). This information DOES affect the compliance determination, so be sure it is correct. For more information about the *Required Information* screen, see Chapter 6.

Optional Information

When you select *Optional Information*, you are asked to provide general information about your project. None of this information affects the compliance determination. All of the information entered in this screen will be included in your reports. For more information about the *Optional Information* screen, see Chapter 10.

Help Menu

The **Help** menu provides general information on how to use MECcheck™. You can scroll through the help screens by using the **Up** and **Down Arrow** keys, **Page Up** and **Page Down** keys, or by clicking on the scroll bar with a mouse. You can remove the help screens by pressing **Escape** or by clicking the mouse on another screen.



Help Menu and Index Submenu

Action Keys The **Action Keys** option displays an abbreviated version of the keys used to run MECcheck™. A more thorough listing is given in Chapter 5.

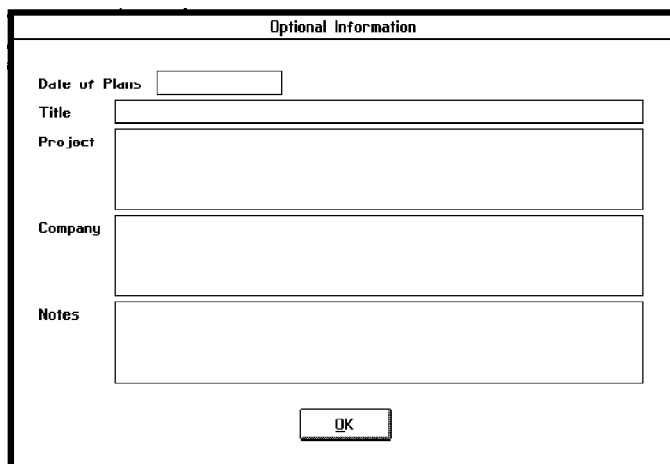
Index The **Index** option brings up a submenu containing a list of help topics. The submenu options are **Menus**, **Mouse Control**, **Files**, **Reports**, and **Help**. You can select these options by using hot keys (such as **Alt+H** for **Help**, **Alt+R** for **Reports**, and **Alt+M** for **Menus**). You can also use arrow keys or a mouse to negotiate through the submenus.

About MECcheck™

The **About MECcheck™** option displays the program's version number and release date.

Optional Information

The *Optional Information* screen is used to enter information about your project. All of the information entered in this screen is included in your project report. None of this information is required by the program to determine compliance with the MEC. This information may be useful, however, to the building department or as a way to track and label your reports.

The image shows a software window titled "Optional Information". Inside the window, there are five text input fields arranged vertically. The first field is labeled "Date of Plans" and is a single-line text box. The second field is labeled "Title" and is a single-line text box. The third field is labeled "Project" and is a multi-line text box. The fourth field is labeled "Company" and is a multi-line text box. The fifth field is labeled "Notes" and is a multi-line text box. At the bottom center of the window, there is a button labeled "OK".

Optional Information Screen

- | | |
|----------------------|--|
| <i>Date of Plans</i> | The <i>Date of Plans</i> field is used to record the date stamped on the building plans. This date can be used to track the plans on which the MECcheck™ documentation is based, in the event that the plans are later modified. |
| <i>Title</i> | The <i>Title</i> field is a single-line text field used to enter a project title. You can use the title to identify specific projects. This title is displayed at the top of your report. |
| <i>Project</i> | Enter a description of your project in the <i>Project</i> field (such as the project name and address). You can use common text-editing keys to enter a description up to 400 characters in length. |
| <i>Company</i> | Enter a description of your company in the <i>Company</i> field (such as the name and address). You can use common text-editing keys to enter a description up to 400 characters in length. |
| <i>Notes</i> | Enter any additional information in the <i>Notes</i> field. You can use common text-editing keys to enter notes up to 400 characters in length. |

HVAC Efficiency

When you select the *HVAC Efficiency* option from the *Trade-Offs* menu, the *Heating and Cooling Efficiency* screen appears. Trade-offs are allowed for efficient gas and oil furnaces, boilers, and electric heat pumps and air conditioners. No credit is given for electric resistance heating.

Heating and Cooling Efficiency			
			Minimum
FURNACE	AFUE	<input type="text" value="0"/>	78.0
BOILER: Except Gas Steam	AFUE	<input type="text" value="0"/>	80.0
BOILER: Gas Steam	AFUE	<input type="text" value="0"/>	75.0
HEAT PUMP:			
Heating Mode	HSPF	<input type="text" value="0"/>	6.8
Cooling Mode	SEER	<input type="text" value="0"/>	10.0
AIR CONDITIONER	SEER	<input type="text" value="0"/>	10.0
No trade-off available for electric resistance heating.			
		<input type="button" value="OK"/>	<input type="button" value="Cancel"/>

Heating and Cooling Efficiency Screen

Minimum-required heating and cooling equipment efficiencies set by NAECA^(a) are displayed in the right-hand column of the screen. If the equipment you plan to install exceeds these minimums, you qualify for the high-efficiency equipment credit. Type the annual fuel utilization efficiency (AFUE), heating seasonal performance factor (HSPF), or seasonal energy efficiency ratio (SEER) in the appropriate space.

You can receive credit for only one piece of heating equipment and one piece of cooling equipment (or a single heat pump). If you plan to install more than one piece of heating equipment or more than one piece of cooling equipment, you must enter the efficiency of the equipment with the lowest rating.

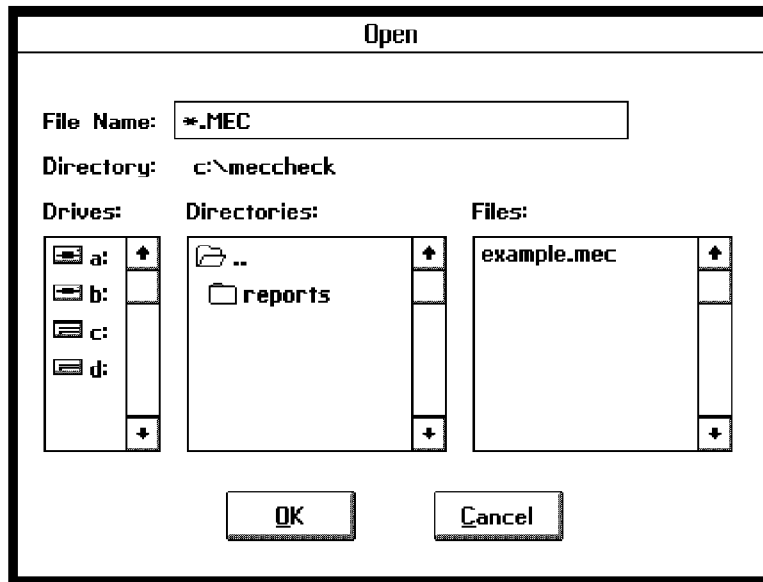
After entering the efficiency of your equipment, select the **OK** button. The HVAC efficiency trade-off line is then added to your building components list, displaying the efficiency of your equipment.

(a) The National Appliance Energy Conservation Act of 1987, 42 USC 6291 et seq., as amended, Public Law 100-12.

The high-efficiency equipment credit is applied as a percent increase in the code house UA. To see how much credit you are getting, observe the UA value displayed in the *Required UA* field. The UA will probably be smaller before taking the credit than after. Some locations along the California coast do not qualify for the cooling equipment credit.

Files

The *Files* screen is used to indicate the names of files and reports you create, open, delete, and print. The *Files* screen is displayed whenever you select *Open*, *Save As*, and *Delete* from the *File* menu. If a file is not currently open, the *Files* screen is displayed when you select *Save* from the *File* menu. If you create a report and choose to save it to a file, the *Files* screen is also displayed.



Files Screen

File Name

The *File Name* field at the top of the screen is a text field used to enter a valid DOS filename. Type in a filename by moving the cursor to the *File Name* field and entering the name of the file you wish to open, save, or delete. Alternatively, you may select an existing file from the *Files* list. To select a file from the *Files* list, use the **Tab** key to move the cursor to the *Files* list box, use the **Up** and **Down Arrows** to scroll through the filenames, and press **Enter** to select a filename. You can also use a mouse by clicking on the scroll bar and then clicking on the desired filename.

Once your filename is selected and displayed in the *File Name* field, select the **OK** button to accept your choice. Alternatively, you can double click the mouse on the desired name in the *Files* list box. This has the same effect as clicking once on the filename and then on the **OK** button.

All data files must have an .MEC extension, and all report files must have an .RPT extension. If you omit the extension when entering a filename, MECcheckTM automatically adds the correct extension for you. When you select file options that

apply only to data files (*Open*, *Save*, *Save As*, and *Delete*), the *Files* list will only contain files that end with the .MEC extension. When you select file options that apply only to report files (*Create Report*), the *Files* list will only contain files that end with the .RPT extension.

<i>Directory</i>	The <i>Directory</i> field always displays the current directory. You cannot alter this field; it is for display only.
<i>Drives</i>	The <i>Drives</i> list is used to change drives. This feature is used to store and retrieve files in other drives on your computer.
<i>Directories</i>	The <i>Directories</i> list is used to change directories. This feature is used to store and retrieve files in other directories on your computer.
<i>Files</i>	The <i>Files</i> list contains the names of all files found in the current directory matching the filename template shown in the <i>File Name</i> field. For example, if the <i>File Name</i> field reads *.MEC, all files ending with the extension .MEC are listed in the <i>Files</i> list.
<i>OK</i>	Select the <i>OK</i> button to choose the file displayed in the <i>File Name</i> field.
<i>Cancel</i>	Select the <i>Cancel</i> button to exit this screen without altering any files.

Definitions

Addition	The MEC applies to new residential buildings and additions to existing buildings. Additions can be shown to comply by themselves without reference to the rest of the building. Alternatively, the entire building (the existing building plus the new addition) can be shown to comply.
Basement Wall	Basement walls that enclose conditioned spaces are part of the building envelope. Basement wall refers to the opaque portion of the wall (excluding windows and doors). To be considered a basement wall, the average gross wall area (including openings) must be at least 50% below grade. Treat walls on each side of the basement individually when determining if they are above grade or basement walls. For any individual wall less than 50% below grade, include the entire opaque wall area as part of the above-grade walls.
Building Envelope	The building envelope includes all components of a building that enclose conditioned spaces (see the definition of conditioned space). Building envelope components separate conditioned spaces from unconditioned spaces or from outside air. For example, walls and doors between an unheated garage and a living area are part of the building envelope; walls separating an unheated garage from the outside are not. Although floors of conditioned basements and conditioned crawl spaces are technically part of the building envelope, the MEC does not specify insulation requirements for these components and they can be ignored.
Ceiling	The ceiling requirements apply to portions of the roof and/or ceiling through which heat flows. Ceiling components include the interior surface of flat ceilings below attics, the interior surface of cathedral or vaulted ceilings, and skylights. The ceiling requirements also apply to floors over outside air, including floor cantilevers, floors of an elevated home, and floors of overhangs (such as the floor above a recessed entryway or open carport).
Conditioned Space	A space is conditioned if heating and/or cooling is deliberately supplied to it or is indirectly supplied through uninsulated surfaces of water or heating equipment or through uninsulated ducts. For example, a basement with registers or heating devices designed to supply heat is conditioned.
Crawl Space	The MEC <i>check</i> TM crawl space wall insulation requirements are for the exterior walls of unventilated crawl spaces (i.e. not directly vented to the outside) below uninsulated floors. A crawl space wall component includes the opaque portion of a wall that encloses a crawl space and is partially or totally below grade.
Door	Doors include all openable opaque assemblies located in exterior walls of the building envelope. Doors with glass can be treated as a single door assembly, in which case an aggregate U-value (a U-value that includes both the glass and opaque area) must be used; OR the glass area of the door can be included with the other

glazing and an opaque door U-value can be used to determine compliance of the door.

Dwelling Unit	A single housekeeping unit of one or more rooms providing complete, independent living facilities, including permanent provisions for living, sleeping, eating, cooking and sanitation.
Envelope	See Building Envelope
Glazing	Glazing is any translucent or transparent material in exterior openings of buildings, including windows, skylights, sliding glass doors, the glass areas of opaque doors, and glass block.
Glazing Area	The area of a glazing assembly is the interior surface area of the entire assembly, including glazing, sash, curbing, and other framing elements. The nominal area or rough opening is also acceptable for flat windows and doors.
Floor Area	<p>Not all floors in a building are considered when computing the floor area for compliance purposes:</p> <ul style="list-style-type: none">• Floors over unconditioned spaces (such as floors over an unheated garage, basement, or crawl space) must be insulated.• Floors over outside air (such as floors of overhangs and floors of an elevated home) must also be insulated but are subject to the ceiling requirements rather than the floor over unconditioned space requirements.• In most locations, slab-on-grade floors of conditioned spaces must be insulated along the slab perimeter.• Floors of basements and crawl spaces are not subject to an insulation requirement and do not have to be included as a building envelope component, even if the basement or crawl space is conditioned. In some cases, however, crawl space wall insulation is required to extend down from the top of the wall to the top of the footing and then horizontally a short distance along the floor.• Floors separating two conditioned spaces are not subject to an insulation requirement and do not have to be included as a building envelope component.
Gross Wall Area	The gross wall area includes the opaque area of above-grade walls, the opaque area of any individual wall of a conditioned basement less than 50% below grade (including the below-grade portions), all windows and doors (including windows and doors of conditioned basements), and the peripheral edges of floors.
Multifamily	A multifamily building is a residential building three stories or less in height that contains three or more attached dwelling units. Multifamily buildings include

apartments, condominiums, townhouses, and rowhouses. Hotels and motels are considered commercial rather than residential buildings.

Net Wall Area The net wall area includes the opaque wall area of all above-grade walls enclosing conditioned spaces, the opaque area of conditioned basement walls less than 50% below grade (including the below-grade portions), and peripheral edges of floors. The net wall area does not include windows, doors, or other such openings, as they are treated separately.

Opaque Areas Opaque areas as referenced in this guide include all areas of the building envelope except openings for windows, skylights, doors, and building service systems. For example, although solid wood and metal doors are opaque, they should not be included as part of the opaque wall area (also referred to as the net wall area).

Raised Truss Raised truss refers to any roof/ceiling construction that allows the insulation to achieve its full thickness over the exterior walls. Several constructions allow for this, including elevating the heel (sometimes referred to as an energy truss, raised-heel truss, or Arkansas truss), use of cantilevered or oversized trusses, lowering the ceiling joists, or framing with a raised rafter plate.

R-Value R-value ($\text{h}\cdot\text{ft}^2\cdot^\circ\text{F}/\text{Btu}$) is a measure of thermal resistance, or how well a material or series of materials resists the flow of heat. R-value is the reciprocal of U-value:

$$R\text{-Value} = \frac{1}{U\text{-Value}}$$

Single Family As defined by the MEC, a single-family building is a detached one- or two-family residential building.

Slab Edge Slab edge refers to the perimeter of a slab-on-grade floor, where the top edge of the slab floor is above the finished grade or 12 in. or less below the finished grade.

U-Value U-value ($\text{Btu}/\text{h}\cdot\text{ft}^2\cdot^\circ\text{F}$) is a measure of how well a material or series of materials conducts heat. U-values for window and door assemblies are the reciprocal of the assembly R-value:

$$U\text{-Value} = \frac{1}{R\text{-Value}}$$

For other building assemblies (such as a wall), the R-value used in the above equation is the R-value of the entire assembly, not just the insulation.

Appendix B

Glazing and Door U-Values

The glazing and opaque door U-value tables provide default U-values for glazing and doors based on the glazing or door features. The U-values in these tables can be used in the absence of NFRC-labeled U-values.

Glazing and doors cannot receive credit for features that cannot be clearly detected, such as argon gas fills and low-emissivity (low-E) coatings. Windows with these features may achieve much lower U-values than those listed in Table B-1. For example, a double-pane wood or vinyl window with low-E glass may have a U-value around 0.38. The same window with argon gas may be rated at 0.34. Therefore, it may be advantageous to use test U-values for these types of windows.

Where a composite of materials from two different product types is used, the window or door must be assigned the higher U-value.

U-Values for Windows, Glazed Doors, and Skylights

Frame/Glazing Features	Single Pane	Double Pane
Metal Without Thermal Break		
Operable	1.30	0.87
Fixed	1.17	0.69
Door	1.26	0.80
Skylight	2.02	1.30
Metal With Thermal Break		
Operable	1.07	0.67
Fixed	1.11	0.63
Door	1.10	0.66
Skylight	1.93	1.13
Metal-Clad Wood		
Operable	0.98	0.60
Fixed	1.05	0.58
Door	0.99	0.57
Skylight	1.50	0.88
Wood/Vinyl		
Operable	0.94	0.56
Fixed	1.04	0.57
Door	0.98	0.56
Skylight	1.47	0.85
Glass Block Assemblies	0.60	

U-Values for Non-Glazed Doors

Steel Doors		
Without Foam Core	0.60	
With Foam Core	0.35	
Wood Doors	Without Storm	With Storm
Panel With 7/16-in. Panels	0.54	0.36
Hollow Core Flush	0.46	0.32
Panel With 1 1/8-in. Panels	0.39	0.28
Solid Core Flush	0.40	0.26

The Building Envelope

The MEC requirements are intended to limit heat loss and air leakage through the building envelope. The building envelope includes all of the building components that separate conditioned spaces (conditioned space is defined in Appendix A) from unconditioned spaces or from outside air. For example, the walls and doors between an unheated garage and a living area are part of the building envelope; the walls separating an unheated garage from the outside are not. Walls, floors, and other building components separating two conditioned spaces (such as an interior partition wall) are *NOT* part of the building envelope, nor are common or party walls which separate dwelling units in multifamily buildings.

You can think of the building envelope as the boundary separating the inside from the outside and through which heat is transferred. Areas that have no heating or cooling sources are considered to be outside the building envelope. A space is conditioned if heating and/or cooling is deliberately supplied to it or is indirectly supplied through uninsulated surfaces of water or heating equipment or through uninsulated ducts.

To use the MEC*check*TM materials, you must specify proposed insulation levels for ceiling, wall, floor, basement wall, slab-edge, and crawl space wall components located in the building envelope. In some cases, it may be unclear how to classify a given building element. For example, are skylight shafts considered a wall component or a ceiling component? The following table can be used to help determine how a given building envelope assembly should be entered in the MEC*check*TM materials.

*Building Envelope Components***Ceiling Components**

Ceiling	Flat ceilings Cathedral or vaulted ceilings Dormer roofs Bay window roofs Overhead portions of an interior stairway to an attic Attic hatches
Floors Over Outside Air ^(a)	Floors of overhangs (such as the floor above a recessed entryway or carport) Floor cantilevers Floors of an elevated home
Skylights	Skylight assemblies
(a) The insulation requirements for floors over outside air are the same as those for ceilings.	

Wall Components

Wall	Opaque portions of above-grade walls Basement walls and kneewalls less than 50% below grade Peripheral edges of floors Gables walls bounding conditioned space Dormer walls Roof or attic kneewalls Through-wall chimneys Walls of an interior stairway to an unconditioned basement Skylight shafts
Glazing	Windows (including basement windows) Sliding glass doors Glass block Transparent portions of doors
Door	Opaque portions of all doors (including basement doors)

Floor and Foundation Components

Floor Over Unconditioned Space	Floors over an unconditioned crawl space, basement, garage, or similar unconditioned space
Basement Wall	Opaque portions of basement walls 50% or more below grade and basement kneewalls (if part of a basement wall 50% or more below grade)
Slab Floor	Perimeter edges of slab-on-grade floors
Crawl Space Wall	Walls of unventilated crawl spaces below uninsulated floors

Project Report

The following pages illustrate a report (EXAMPLE.RPT) that was created from data stored in the project data file EXAMPLE.MEC. Both EXAMPLE.RPT and EXAMPLE.MEC are included on the MECcheck™ diskettes. To load this data file into the program, select *File->Open* and choose EXAMPLE.MEC from the *Files* list.

MECcheck™ asks you to choose a location from a list of cities or counties, depending on which version you are using. The EXAMPLE.RPT report file was created using the cities version. A report created with the counties version would contain the name of a county instead of a city.

MECcheck COMPLIANCE REPORT
 1995 Model Energy Code
 MECcheck Software Version 2.0

Permit #

Checked by/Date

CITY: Greensboro
 STATE: North Carolina
 HDD: 3877
 CONSTRUCTION TYPE: Single Family
 DATE: 1-2-1996

DATE OF PLANS: 11-18-95

TITLE: North Meadows Development
 PROJECT INFORMATION:
 1010 Construction Ave.
 Greensboro, North Carolina
 Guilford County

COMPANY INFORMATION:
 Careful Builders, Inc.
 120 "W" St.
 Greensboro, NC 27411
 704-321-9445

COMPLIANCE: PASSES
 Required UA = 467
 Your Home = 416

	Area or Perimeter	Insul R-Value	Sheath R-Value	Glazing/Door U-Value	UA
CEILINGS	729	38.0	0.0		22
CEILINGS	592	30.0	0.0		21
WALLS: Wood Frame, 16" O.C.	1339	13.0	6.0		82
WALLS: Wood Frame, 16" O.C.	258	13.0	0.0		21
GLAZING: Windows or Doors	204			0.450	92
GLAZING: Windows or Doors	84			0.610	51
DOORS	20			0.540	11
DOORS	18			0.350	6
FLOORS: Over Unconditioned Space	938	19.0			45
FLOORS: Over Outside Air	32	30.0			1
SLAB FLOORS: Unheated, 24.0" insul.	82	8.0			64

COMPLIANCE STATEMENT: The proposed building design represented in these documents is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the requirements of the 1995 CABO Model Energy Code.

Builder/Designer _____ Date _____

Compliance Report: EXAMPLE.RPT

MECcheck INSPECTION CHECKLIST
 1995 Model Energy Code
 MECcheck Software Version 2.0
 North Meadows Development
 DATE: 1-2-1996

Bldg.
 Dept.
 Use

CEILINGS:

- [] 1. R-38
 Comments/Location_____
- [] 2. R-30
 Comments/Location_____

WALLS:

- [] 1. Wood Frame, 16" O.C., R-13 + R-6
 Comments/Location_____
- [] 2. Wood Frame, 16" O.C., R-13
 Comments/Location_____

WINDOWS AND GLASS DOORS:

- [] 1. U-value: 0.45
 For windows without labeled U-values, describe features:
 # Panes_____ Frame Type_____ Thermal Break? [] Yes [] No
 Comments/Location_____
- [] 2. U-value: 0.61
 For windows without labeled U-values, describe features:
 # Panes_____ Frame Type_____ Thermal Break? [] Yes [] No
 Comments/Location_____

DOORS:

- [] 1. U-value: 0.54
 Comments/Location_____
- [] 2. U-value: 0.35
 Comments/Location_____

FLOORS:

- [] 1. Over Unconditioned Space, R-19
 Comments/Location_____
- [] 2. Over Outside Air, R-30
 Comments/Location_____

SLAB-ON-GRADE FLOORS:

- [] 1. Unheated, 24.0" insul., R-8
 Comments/Location_____
- Slab insulation to extend down from the top of the slab to at least 24" OR down to at least the bottom of the slab then horizontally for a total distance of 24".

Inspection Checklist: EXAMPLE.RPT

[]	AIR LEAKAGE: Joints, penetrations, and all other such openings in the building envelope that are sources of air leakage must be sealed. Recessed lights must be type IC rated and installed with no penetrations or installed inside an appropriate air-tight assembly with a 0.5" clearance from combustible materials and 3" clearance from insulation.
[]	VAPOR RETARDER: Required on the warm-in-winter side of all non-vented framed ceilings, walls, and floors.
[]	MATERIALS IDENTIFICATION: Materials and equipment must be identified so that compliance can be determined. Manufacturer manuals for all installed heating and cooling equipment and service water heating equipment must be provided. Insulation R-values and glazing U-values must be clearly marked on the building plans or specifications.
[]	DUCT INSULATION: Ducts in unconditioned spaces must be insulated to R-5. Ducts outside the building must be insulated to R-6.5.
[]	DUCT CONSTRUCTION: All ducts must be sealed with mastic and fibrous backing tape. Pressure-sensitive tape may be used for fibrous ducts. The HVAC system must provide a means for balancing air and water systems.
[]	TEMPERATURE CONTROLS: Thermostats are required for each separate HVAC system. A manual or automatic means to partially restrict or shut off the heating and/or cooling input to each zone or floor shall be provided.
[]	MISC REQUIREMENTS: Refer to the MECcheck Manual for requirements relating to swimming pools, HVAC piping conveying fluids above 120 F or chilled fluids below 55 F, and circulating hot water systems.
<p>----NOTES TO FIELD (Building Department Use Only)-----</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	

Inspection Checklist (cont.): EXAMPLE.RPT

Changing Location Files

The following text provides instructions for changing from the city version of the MECcheck™ software to the county version.

The MECcheck™ software contains three location files:

- 1) The CITIES file contains a list of cities for each state.
- 2) The COUNTIES file contains a list of counties for each state.
- 3) The LOCATION file is the file that is actually used by the software. By default, the LOCATION file is identical to the CITIES file. When you start the software you will be presented with a list of cities.

Changing to Counties

If you prefer to use the county version, copy the COUNTIES file into the LOCATION file by typing the following command while in the directory where the MECcheck™ files are located:

COPY COUNTIES LOCATION

Changing Back to Cities

Type the following command to copy the list of cities back into the LOCATION file:

COPY CITIES LOCATION

Noteworthy...

If you have saved a data file for a building, the location for that building is also saved. If you subsequently change the LOCATION file as described above and try to load that data file back into the MECcheck™ software, MECcheck™ will not find the specified building location and will set the location to a default. Therefore, after loading the file into the program, you must go back to the *Required Information* screen and reselect your location.

Appendix F

Modifying the Cities or Counties

MECcheck™ accesses a list of cities or counties, depending on which version you are using. The cities are stored in a file named CITIES and the counties are stored in a file named COUNTIES. These files come with the MECcheck™ software and should be located in the same directory as the MECcheck™ executable file (MECCHECK.EXE).

The software uses a file named LOCATION, which will be identical to either the CITIES file or the COUNTIES file. The first line of the CITIES file contains the word **cities* and the first line of the COUNTIES file contains the word **counties*. This keyword tells the software whether cities or counties are currently contained in the LOCATION file, and should not be changed. The following text and illustration apply to the cities version. However, modifications can be made to the counties version in exactly the same manner.

The CITIES file begins with an alphabetical list of the states. The second line of the file contains an asterisk (*) followed by the word *states*. All asterisks are very important because they delineate the sections of the file.

```
*cities
*states
Alabama
Alaska
Arizona
:
:
Wisconsin
Wyoming
Cuba
Puerto Rico
Virgin Islands
*Alabama
Andalusia,2305,24260,
Anniston,2879,18152,
:
:
Union Springs,2432,21872,
Valley Head,3968,13018,
*Alaska
Adak,8938,0,
Anchorage,10825,35,
:
:
Wrangell,8204,361,
Yakutat,9609,1,
*Arizona
:
:
etc.
```

Cities File

The list of states is followed by lists of cities for each state. The cities for each state are listed separately, starting with the cities for Alabama. The Alabama cities start directly after the line reading **Alabama*.

Each city name is followed by two climate values that apply to that city. The first value represents the heating degree-days base 65°F (HDD), and the second value represents the cooling degree-hours base 74°F (CDH). A comma is used to separate the city name, HDD, and CDH values. A comma also terminates each line. Each line must include three commas (and no more). Commas MAY NOT be used as part of a city name. Remove extra space on either side of all commas.

To add, delete, or modify cities:

- 1) Find the list of cities you wish to modify.
- 2) Add, delete, or modify as many city lines as you wish. Each new line must adhere to the format described above.

To delete an entire state:

- 1) Delete the state name from the list of states located at the beginning of the file.
- 2) Delete the list of cities corresponding to that state. Be sure to delete all cities AND the name of the state which precedes them.

To add a new state:

- 1) Add the state name to the list of states located at the beginning of the file. Locate the name in alphabetical order.
- 2) Insert the list of cities into the correct location in the file. The cities for each state should follow the same order as the list of states. For example, if Alaska is second in the list of states, the Alaska cities should be the second group of cities in the file. The first line of your new cities list should contain an asterisk followed by the state name. You may insert any number of cities after the state name as long as each city is placed on a separate line along with its corresponding HDD and CDH values.